

## PATENT SPECIFICATION.



Application Date : May 19, 1925. No. 13,017 / 25.

257,009

„ „ Jan. 12, 1926. No. 822 / 26.

One Complete Left : Feb. 19, 1926.

Complete Accepted : Aug. 19, 1926.

### PROVISIONAL SPECIFICATION.

No. 13,017, A.D. 1925.

### Improvements in Attaching Devices for Motor Vehicle Shock-absorbers.

I, FRANK SMITH, British subject, of the firm of Frank Smith and Company (Elland) Limited, Huddersfield Road, Elland, in the County of York, Engineer, do hereby declare the nature of this invention to be as follows:—

This invention relates to shock-absorbing devices of mechanically propelled vehicles and is more particularly directed to the provision of means for connecting the shock-absorbing device to oppositely moving parts of the vehicle, and has for its object the construction of such means in such a manner that they will be capable of movement in a plurality of directions, provide for side roll of the vehicle parts and maintain the supporting members and the friction member of the shock-absorber in their relative operating positions giving the greatest efficiency regardless of the direction or degree of movement of the parts of the vehicle to which the supporting arms are attached.

Hitherto devices having the same object have embodied what appears to be an universal joint connection but this does not and cannot work correctly due to the fact that while one pin is maintained in a horizontal and transverse direction, the other axes move in an angular direction in line with the centre of the arms, and consequently cannot function correctly for the distortion above referred to, with my device I overcome this difficulty.

According to my invention each of the supporting members connecting the shock-absorbing device to oppositely moving parts of one vehicle hinges upon one pin or stud laterally projecting from the

chassis or the like and from the axle or the like. One stud has a shoulder engaging a part of the vehicle and carries the coupling or head of one of the supporting levers the other end of which is connected to the shock-absorber, within which is fitted a rounded compressed cork sleeve which projects at each side of the head and abutting against the collar aforesaid, a washer and a nut screwing on to the end of the stud secures the head thereto and to take up the wear and tear of the cork sleeve.

The other stud receives the coupling or head of the corresponding supporting lever which has a cylindrical compressed cork sleeve or of other resilient material therein surrounding said stud or two or more similar sleeves or bushes may be inserted one from each end, and wear and tear is taken up in this instance also by a nut and washer screwing upon one end. Or I may form two converging conical bores within said coupling head and insert from each side two corresponding conical sleeves or bushes either of compressed cork or of compressed cork and rubber also projecting outside thereof and which are also engaged by nut and washer for the purposes aforesaid.

As a further modification, I may mount upon one of the said studs a ball head, and the coupling head is adapted to receive the same; upon the boss or collar of the stud I shape an angular side face abutting upon the coupling head in order to prevent the latter from having a side movement but free in any other direction.

[Price 1/-]

Or I may employ upon one stud in combination with any of the connections already described, a ball cage within the coupling, which will have the same effect.

Dated the 18th day of May, 1925.  
JOHN E. WALSH & Co.,  
Waterhouse Chambers, Crossley Street,  
Halifax,  
Agents for the Applicant.

10

# PROVISIONAL SPECIFICATION.

No. 822, A.D. 1928.

## Improvements in Attaching Devices for Motor Vehicle Shock-absorbers.

I, FRANK SMITH, British subject, of the firm of Frank Smith and Company (England) Limited, Huddersfield Road, Elland, in the County of York, Engineer, do hereby declare the nature of this invention to be as follows:—

This invention relates to shock-absorbing devices of mechanically propelled vehicles, and is more particularly directed to the provision of means for connecting the shock-absorbing device to oppositely moving parts of the vehicle, and has for its object the construction of such means in such a manner that the levers connecting the shock-absorbing device to the vehicle will be capable of movement in a plurality of directions, provide for side roll of the vehicle parts and maintain the supporting members and the friction member of the shock-absorber in their relative operating positions giving the greatest efficiency regardless of the direction or degree of movement of the parts of the vehicle to which the supporting arms or levers are attached.

Hitherto devices having the same object have embodied what appears to be an universal joint connection, but this does not and cannot work correctly due to the fact that while one pin is maintained in a horizontal and transverse direction the other axis moves in an angular direction in line with the centre of the arms, and consequently cannot function correctly for the distortion above referred to, with my device I overcome this difficulty.

My invention consists essentially of a simple and cheap form of resilient bearing for the supporting members connecting the friction member of a shock-absorbing device to oppositely moving parts of the vehicle, embodying a rubber, cork, or similar elastic bush adapted to fit within the head or coupling of said supporting member but of greater length than the bore thereof, and the displacing of the ends of said bush whereby an

elastic bearing is provided at the sides of said head or coupling as well as in the bore, which also serves to key the head upon the bush and to allow the desired freedom of movement of the supporting member in accordance with the direction or degree of movement of the oppositely moving parts of the vehicle.

In carrying out my invention, the bore of each head or coupling of the aforesaid supporting members normally hinging upon pins or studs projecting from the chassis or the like and from the axle or the like, is flared slightly at each end and adapted to receive a cylindrical bush or sleeve composed of rubber, compressed cork or other suitable resilient material. The bush is of a length adapted to project some distance at each side of the head so that upon positioning the head or coupling of the supporting arms upon the corresponding pins or studs as aforesaid, one end of said bush abuts upon a shoulder or fixed collar thereon whilst the other end is engaged by a washer with a nut screwing on to the end of the stud.

Upon tightening up the nut the bush is nipped between the collar and the washer causing the projecting ends to be displaced or expanded until they fill the flared ends of the bore and form an elastic bearing or buffer between the collar and the head or coupling on one side, and the washer and head upon the other side, for the purposes before described.

To obtain the best results it is preferable that the diameter of the fixed collar and the washer does not exceed that of the bore of the corresponding head or coupling. Should the diameter of these parts exceed that of said bore it may be necessary to extend the projecting parts of the bush.

In a modification, where the length of the bush corresponds with that of the bore the diameter of the collar and the

5 washer also correspond with that of the  
bore, so that upon tightening up the nut  
aforesaid, a displacement of the bush  
may engage an annular recess in said  
bore, and the displacement of the ends of  
the latter may be increased to any desired  
extent so that the edges of said collar and  
washer do not directly engage with the  
head and interfere with the movement  
10 of the supporting arm. In addition a  
rubber washer may be fitted between the  
collar and bush and between the washer  
and bush if desired with like results.

15 If desired, and as a modification of  
the invention before described one or  
both of the rubber or the like bushes  
may have a fibre lining fitting directly  
on to the pin or stud and a washer com-  
posed of similar material and of corre-  
sponding diameter engaging each end  
thereof.

20 As a further modification, and in lieu

of the cylindrical bush or sleeve I may  
employ a rounded sleeve or bush and to  
adapt the head of the supporting mem- 25  
ber to such a construction I preferably  
form the same in two parts. Or I may  
employ two or more separate resilient  
sleeves or bushes one or more of which  
may be inserted in the bore of the afore- 30  
said head from each end and these bushes  
may be plain or flanged. In each case  
the bush or bushes are similarly engaged  
by and nipped between a fixed collar and  
loose washer by the tightening up of a 35  
nut screwing on to the supporting stud,  
as before described.

Dated this 11th day of January, 1926.

JOHN E. WALSH & Co.,  
Waterhouse Chambers, Crossley Street, 40  
Halifax,  
Agents for the Applicant.

### COMPLETE SPECIFICATION.

#### Improvements in Attaching Devices for Motor Vehicle Shock- absorbers.

45 I, FRANK SMITH, British subject, of  
the firm of Frank Smith and Company  
(Elland) Limited, Huddersfield Road,  
Elland, in the County of York, Engineer,  
do hereby declare the nature of this  
invention and in what manner the same  
is to be performed, to be particularly  
described and ascertained in and by the  
50 following statement:—

This invention relates to shock-absorb-  
ing devices of mechanically propelled  
vehicles, and is more particularly  
55 directed to the provision of means for  
connecting the shock-absorbing device to  
oppositely moving parts of the vehicle,  
and has for its object the construction and  
arrangement of a simple cheap and  
60 improved form of resilient bearing within  
the head or coupling of the supporting  
levers or members hinging upon pins or  
studs connecting the shock-absorber to  
the vehicle, whereby the said pins or  
65 studs are given or permitted an angular  
freedom of movement within the said  
bearing in a plurality of directions, so as  
to provide for side roll of the vehicle  
parts, and are adapted to maintain the  
70 supporting members and the friction  
members of the shock-absorber in their  
relative operating positions giving the  
greatest efficiency regardless of the direc-  
tion or degree of movement of the parts  
75 of the vehicle to which the supporting

arms or levers are attached. Also, to  
secure the aforesaid head or coupling  
upon the said bearing.

It has already been proposed to pro- 80  
vide a shock-absorber of the friction-arm  
class, mounted between vehicle-frame  
and axle, the connection of the arm  
being effected by means of a link, which  
either is itself of resilient material, or  
whose shackle cross pins pass through 85  
blocks of resilient material accommo-  
dated in chambers or shells secured  
respectively to the arm and the part to  
which it has to be fastened, in such a  
manner that while the resilient means 90  
act immediately, the friction elements do  
not come into operation until a certain  
force has been exceeded. These pins  
however are incapable of separate angular  
movement. Devices having the same 95  
object have embodied what appears to be  
an universal joint connection, but this  
does not and cannot work correctly due  
to the fact that while one pin is main-  
tained in a horizontal and transverse 100  
direction the other axis moves in an  
angular direction in line with the centre  
of the arms or levers, and consequently  
cannot function correctly for the distor-  
tion above referred to. With my device 105  
I overcome this difficulty.

My improved bearing consists essen-  
tially of a resilient bush or bushes com-

posed of rubber, cork, or the like in connection with the head or coupling of the arms or supporting members of the shock-absorber, preferably of greater length than the bore thereof. When fitting the head or coupling upon pins or studs secured to the vehicle, the bush or bushes serve as a bearing therefor adapted to permit either stud to take up an angular position relative to the other stud in a plurality of directions with little or no interference with the arms of the shock-absorber or the functioning thereof. The head or coupling and the resilient bush or bushes therein may be prevented from varying their relative positions when positioned upon the aforesaid pins or studs either by distortion of the rubber or the like resilient bush or bushes by the pins or studs or by the shape of said bush or bushes and the bore in the head, or by the construction of the bore in the latter. The projecting ends of the resilient bush or bushes upon the head or coupling being positioned upon the pin or stud, are engaged by a fixed collar and a loose washer therein preferably corresponding in diameter with the diameter of the bore in the said head the washer being engaged by a nut screwing thereon.

If desired, but which form no part of my invention, I may fit a split fibre lining to said bush or bushes, with a corresponding washer adapted to engage each end thereof, or I may fit the said washers only.

By screwing up the nut upon the pin or stud, the shape of the bush or bushes is displaced, and all wear thereof is taken up thereby.

The invention will now be described with reference to the accompanying drawings, in which:—

Fig. 1 shows a sectional elevation of the head or coupling of a supporting member adapted to receive a resilient bush therein according to my invention.

Figs. 2, 3 and 4 are modifications of Fig. 1.

Fig. 5 is a sectional elevation of a resilient bush adapted to fit the head or coupling shown at Fig. 1.

Figs. 6, 7 and 8 are modifications of Fig. 5 adapted to fit the head or coupling shown at Figs. 2, 3 and 4 respectively.

Fig. 9 is a sectional elevation of my improved bearing and means for attaching the supporting members of a shock-absorbing device to a projecting pin or stud upon one of oppositely moving parts of a motor vehicle, showing the resilient bush before any distortion thereof.

Fig. 10 is a similar view to Fig. 9

showing the distortion of a resilient bush whereby the head or coupling of a supporting member is secured therein.

Fig. 11 is a similar view to Figs. 9 and 10 showing the relative distortion of a resilient bush or bearing within the head or coupling, by an angular movement of the pin or stud therein following a side roll of the vehicle.

Figs. 12 and 13 are side and end elevations of a fibre or similar lining which may be employed if desired, in combination with the resilient bush or bushes.

Fig. 14 is a side elevation of a fibre washer used in connection with the resilient bush, with or without the fibre lining.

Fig. 15 is a similar view to Fig. 10 showing the employment in connection with a resilient bush, of a fibre lining and washers illustrated at Figs. 12, 13 and 14.

Fig. 16 is also a similar view to Fig. 10 showing my improved resilient bush employed in connection with a slightly modified form of head or coupling, for securing the latter upon the resilient bush or bushes.

Fig. 17 is a similar view to Fig. 10 showing the assembly of two bushes of the kind shown at Fig. 6 upon a pin or stud in conjunction with the head or coupling illustrated at Fig. 2.

Fig. 18 is a similar view to Fig. 10 showing the assembly of two bushes of the kind illustrated at Fig. 7 in conjunction with the head or coupling illustrated at Fig. 3 and before the distortion of said bushes.

Fig. 19 is a similar view to Fig. 18 showing a cork bush or lining employed in conjunction with the resilient bushes illustrated at Fig. 7.

Fig. 20 is a similar view to Fig. 17 showing the assembly of the parts illustrated at Figs. 4 and 8.

Figs. 21 and 22 are similar views to Figs. 9 and 10 respectively, showing a modification of the resilient bushes and their shape both before and after distortion for securing the head or coupling thereon.

Similar letters refer to similar parts throughout the several views.

Referring to the drawings:—In carrying out my invention the bore A of each head or coupling B of the supporting members C connecting the friction members of a shock-absorber with pins or studs D projecting from the chassis or the like, or the axle or the like E, or both, is preferably flared slightly at each end at F and adapted to receive a cylindrical or other suitable bush or sleeve G composed of resilient material

such as rubber or cork which loosely fits directly upon the stud D aforesaid. The bush G preferably composed of rubber is preferably of a length adapted to project a suitable distance at each side of the head B, so that when the head with its resilient bush is positioned upon D one end of said bush abuts upon or engages the shoulder of a fixed collar or the like H thereon preferably corresponding in diameter with that of the bore A, whilst the other end is engaged by a washer J also of corresponding diameter, with a nut K screwing upon this end of stud D, as shown clearly at Fig. 9.

Upon tightening up the nut K the resilient bush G is clamped between the collar H and the washer J affecting the shape of the ends thereof which are distorted or expanded until they fill the flared ends F, forming beaded edges or flanges therein at each side of the head B which maintain the latter in its desired position thereon, as is clearly shown at Fig. 10 of the drawings. Should parts of the vehicle be subjected to side roll the stud D of the part affected moving integrally therewith is permitted a corresponding angular movement within the resilient bush G displacing parts thereof as is clearly shown at Fig. 11 without affecting the corresponding stud in the other head, or the functioning of the shock-absorber or disturbing the relative operating positions of the supporting members and the friction members thereof, as aforesaid.

For the purpose of lessening friction between the bush G and the contacting parts of the stud D, collar H and washer J, I may fit within said sleeve a suitable thin fibre bush or sleeve L split at one side at M and similar washers N adapted to fit each end of said sleeve L as is clearly shown at Fig. 15.

As a modification of the head or coupling before-mentioned I may form an annular groove or grooves P in the bore A which is also filled by the distortion of the bush G when screwing up the nut K as before described (see Fig. 16).

In further modifications, I may form an internal web or flange R within the head B and in place of a single bush I employ two bushes D inserted from each end thereof (see Fig. 17). Or I may form the head B with two converging conical bores A, A, of known construction and insert from each side two correspondingly shaped resilient bushes (see Figs. 7 and 18). Also (see Fig. 19), I may employ, if desired, in combination with the rubber bushes of Figs. 17 and 18, a suitable cork or fibre bush or sleeve S. The bushes both of rubber and cork

in Figs. 17, 18 and 19, also preferably project a suitable distance from the sides of the head B as previously shown and described, the head B being secured upon the said bush or bushes by the securing flange and nut, without any displacement of the bushes, if desired.

In another modification (see Fig. 20), I may employ a rounded or spherical cork bush or sleeve within a correspondingly rounded bore with flared ends in the head or coupling aforesaid, as shown more clearly at Fig. 4 of the drawings. This cork bush also projects at each side of the head B and is similarly secured between the collar H and the washer J by the nut K screwing upon the stud D as before described. To insert the said resilient bush within the head or coupling it may be necessary to divide the latter. T is a grub-screw, pin or the like for locking said nut K after adjustment.

Collars H and washers J constructed of larger diameter than the bore of the head or coupling B may be employed with a similar effect if desired, as is clearly shown at Figs. 21 and 22, where flanged resilient bushes are used, which in functioning prevent any contact being made by the metallic portion of the head B with either the collar H or the washer J during the angular movements of the pin or stud within the said bush or bushes, also, I may employ a collar H and washer J of lesser diameter than the bore A and a bush or bushes of a length not exceeding the latter, with similar results, the larger diameter of the bush ensures that no contact is made by the head B with its metallic supports during the functioning of the parts aforesaid, but the free angular movement of the pin therein will be less than in the original device.

By this construction of attaching means it will be obvious that an extraordinary amount of side roll on the part of the vehicle or its parts must take place before the pins or studs, to which are connected the supporting members of the shock-absorber, in their angular movements within the flexible or resilient bearing in said members, impart any twisting stress upon the latter likely to interfere with the efficient working thereof. The screwing up of the nut K upon the stud D for the purpose of securing the bush or bushes G thereon, or for securing the head B upon said bush or bushes by distortion of the latter, is also adapted to take up wear in the bush or bushes, when required.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is

to be performed, I declare that what I claim is:—

1. Attaching devices as aforesaid wherein the head or coupling of the supporting levers or members of a shock-absorbing device hinge upon pins or studs characterized by the said pins or studs being directly secured to the chassis and axle respectively of the motor vehicle, and by the provision in connection with said heads of a resilient bush or bushes adapted to serve as a bearing for the aforesaid pins or studs whereby the latter are allowed an angular freedom of movement therein, so as to maintain the supporting members and friction members of the shock-absorber in their relative operating positions substantially as and for the purposes described.
2. Attaching devices according to Claim 1, characterized by the head or coupling of the supporting levers or members of a shock-absorbing device being secured to the resilient bush or bushes therein by the grip and shape of the latter consequent upon their distortion upon the pin or stud carrying same.
3. Attaching devices according to Claim 1, characterized by the head or coupling of the supporting levers or members of a shock-absorbing device, having a bore flared at each end, and by the distortion of the projecting parts of the resilient bush or bushes so that they engage said flared parts for the purposes specified.
4. Attaching devices according to Claim 1, characterized by the pin or stud having a fixed collar and a loose washer thereon preferably of a diameter corre-

sponding with the diameter of the bore in the head or coupling and adapted to engage the ends of the resilient bush or bushes, and a nut screwing upon the said pin into engagement with the loose washer, whereby the said bush or bushes are distorted to engage the flared parts of the aforesaid bore.

5. Attaching devices according to Claim 1, characterized by a rounded or spherical resilient bush adapted to fit within a correspondingly shaped bore in the head or coupling of supporting members of a shock-absorbing device hinging upon a pin or stud, said bush having parts projecting from said bore engaged by means securing the said head and bush upon a pin or stud, for the purposes specified.

6. Attaching devices according to Claim 1, characterized by the head or coupling of the supporting members of a shock-absorbing device, having a flared bore or an annular internal flange therein with resilient bushes fitting said bore adapted to maintain the said bushes and head in their relative positions upon the pin or stud, as and for the purposes specified.

7. Attaching devices as aforesaid, characterized by the construction, arrangement and combination of the parts as herein described, or with reference to the accompanying drawings.

Dated this 18th day of February, 1926.

JOHN E. WALSH & Co.,  
Waterhouse Chambers, Crossley Street,  
Halifax,  
Agents for the Applicant.

FIG. 1.

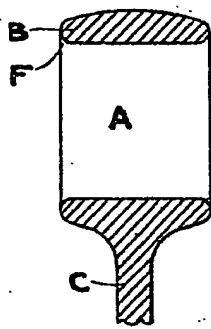


FIG. 2.

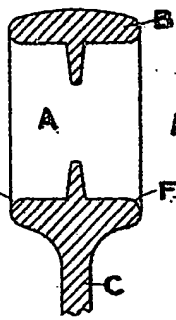


FIG. 3.

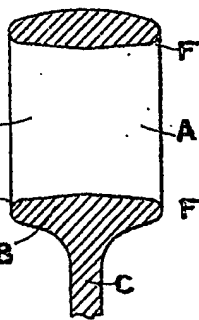


FIG. 4.

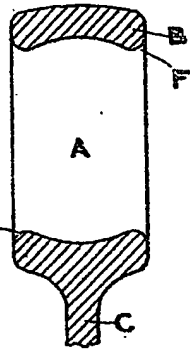


FIG. 5.

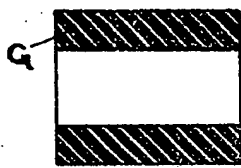


FIG. 6.

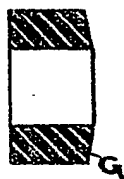


FIG. 7.

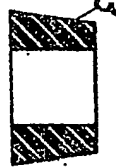


FIG. 8.

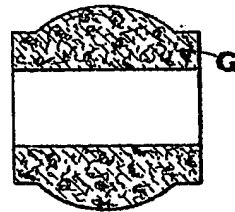


FIG. 9.

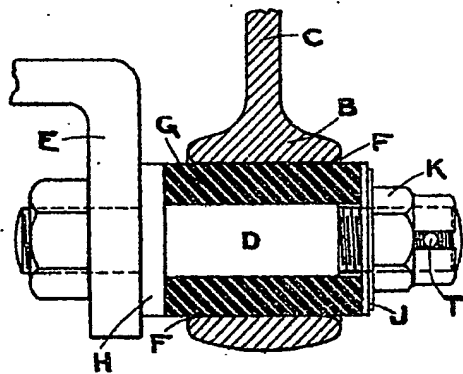


FIG. 10.

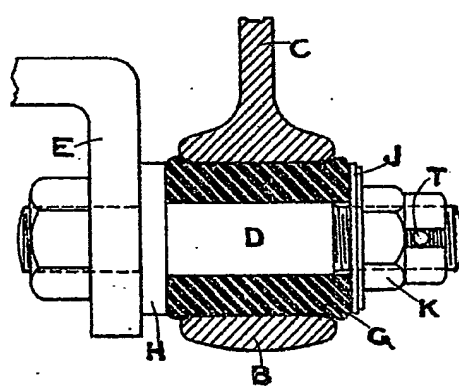


FIG. 11.

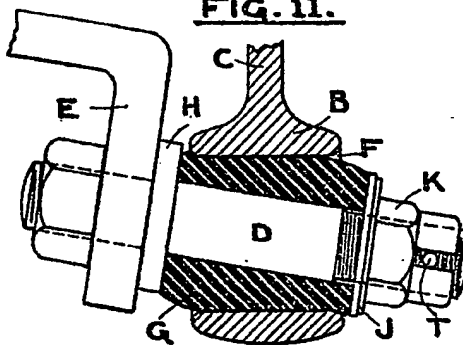


FIG. 12.

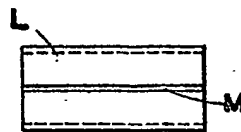
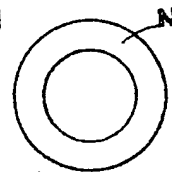


FIG. 13.



FIG. 14.



[This Drawing is a reproduction of the Original on a reduced scale.]

SHEET 1

FIG. 15.

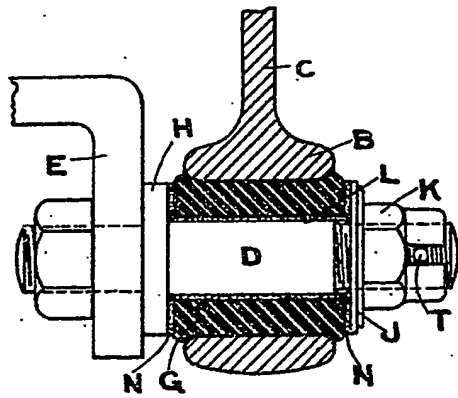


FIG. 16.

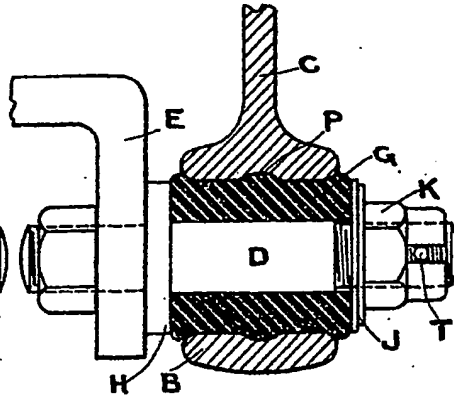


FIG. 17.

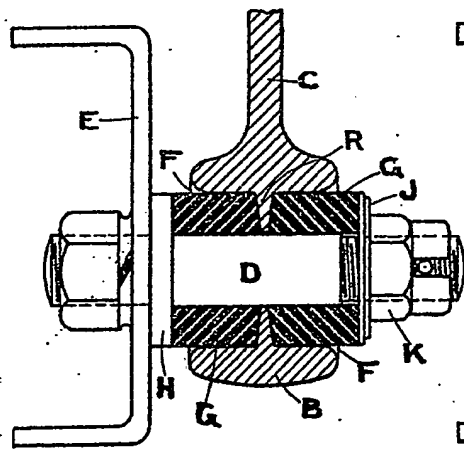


FIG. 18.

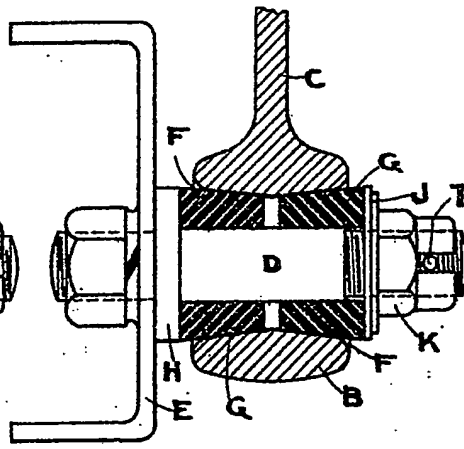


FIG. 19.

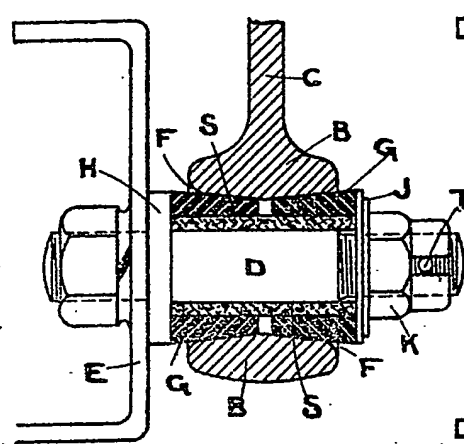


FIG. 20.

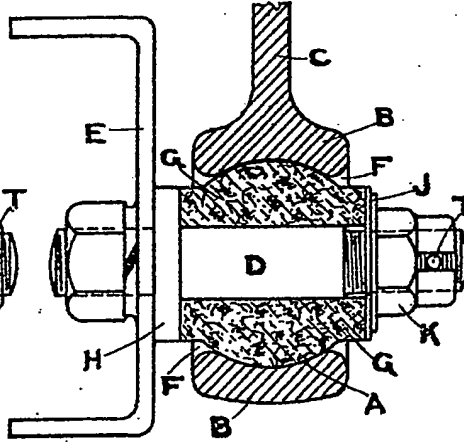




FIG. 1. FIG. 2. FIG. 3. FIG. 4.

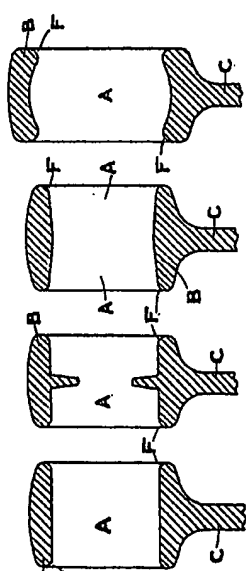


FIG. 5. FIG. 6. FIG. 7. FIG. 8.

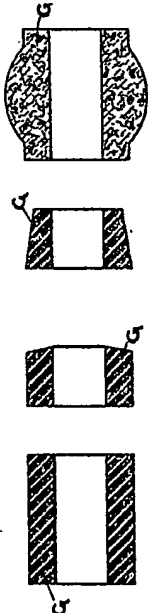


FIG. 9. FIG. 10.

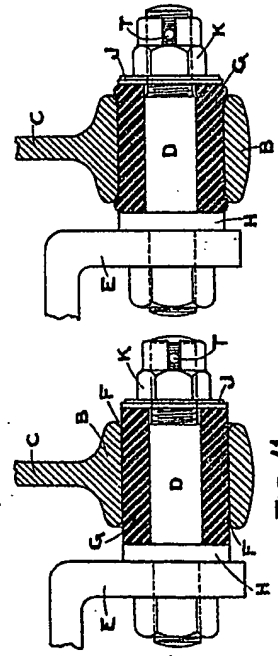


FIG. 11. FIG. 12.

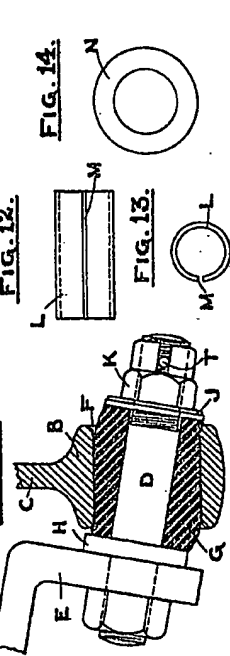


FIG. 13. FIG. 14.

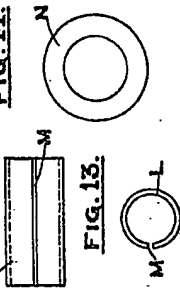


FIG. 15.

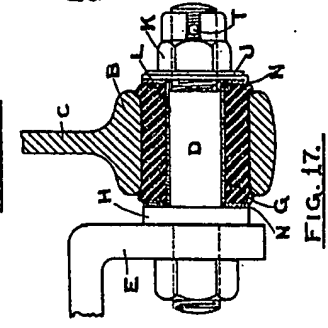


FIG. 17.

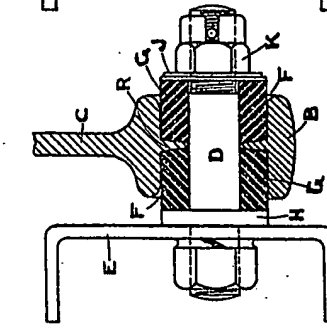


FIG. 19.

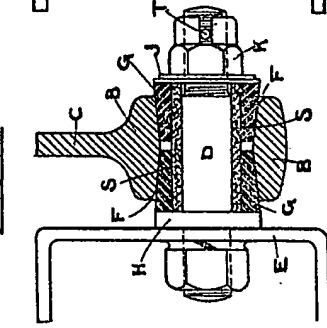


FIG. 20.

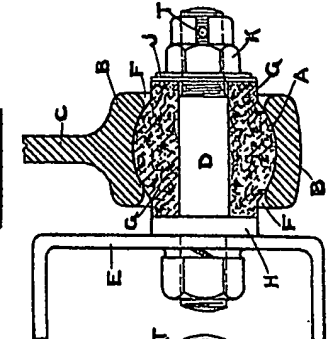


FIG. 16.

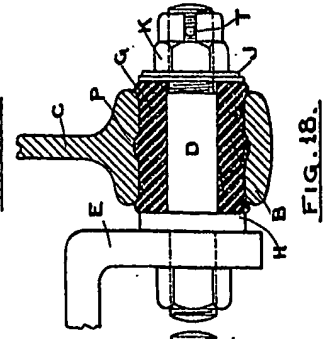
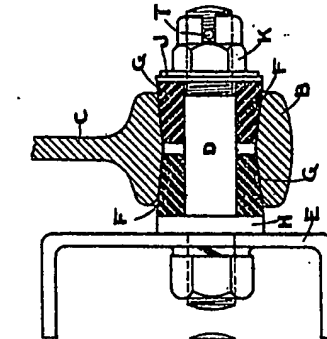


FIG. 18.



[This Drawing is a reproduction of the Original on a reduced scale]

2nd Edition

FIG. 21.

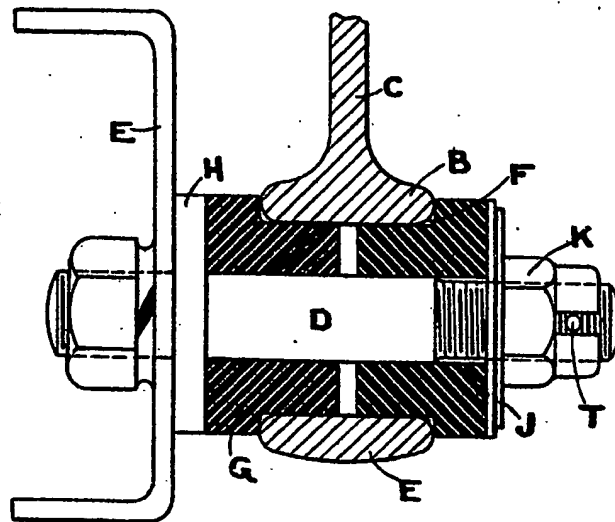
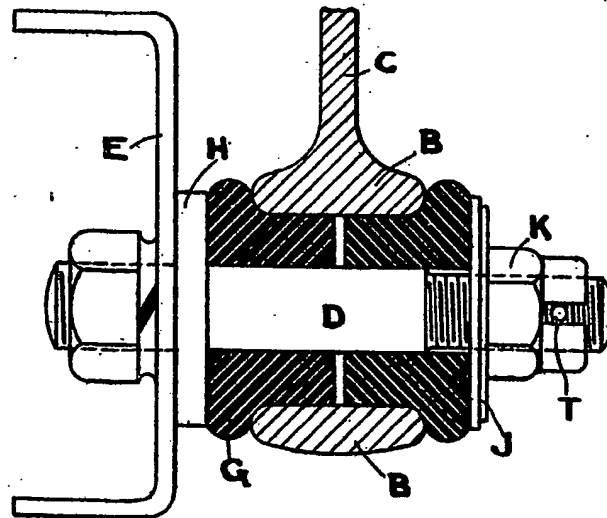


FIG. 22.



*[This Drawing is a reproduction of the Original on a reduced scale.]*

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☐ FADED TEXT OR DRAWING
- ☒ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☒ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**